ABSTRACT:

The bipolar transistor comprises a collector region (1) of a semiconductor material having a first doping type, a base region (2) of a semiconductor material having a second doping type, and an emitter region (3) having the first doping type. A junction is present between the emitter region (3) and the base region (2), and, viewed from the junction (4), a depletion region (5) extends into the emitter region (3). The emitter region (3) comprises a layer (6) of a first semiconductor material and a layer (7) of a second semiconductor material.

The first semiconductor material has a higher intrinsic carrier concentration than the second semiconductor material. The layer (7) of said second semiconductor material is positioned outside the depletion region (5). The second semiconductor material has such a doping concentration that Auger recombination occurs.

The invention also relates to a semiconductor device comprising such a bipolar transistor.

The method of manufacturing the bipolar transistor comprises the step of forming an emitter region (3) with a first doping type on a collector region (1) of a semiconductor material with a first doping type, and a base region (2) of a semiconductor material having a second doping type. The emitter region (3) is formed by epitaxially depositing a first layer (6) of a first semiconductor material and subsequently epitaxially depositing a second layer (7) of a second semiconductor material. The second layer (7) is doped with the first doping type, such that Auger recombination occurs. The intrinsic carrier concentration of the second semiconductor material is higher than the intrinsic carrier concentration of the first semiconductor material.

The Auger recombination dominates the base current and allows accurate tuning of the base current and the current gain of the bipolar transistor.

Fig. 1